SOUTHWEST FISHERIES SCIENCE CENTER
FOURTH QUARTER REPORT - FY 2004
For the Period July 1 - September 30

Submitted by: Roger Hewitt, Division Director, Fisheries Resources Division

Title of Accomplishment or Milestone: Southern California Juvenile Pelagic Shark Survey

Current Status of Accomplishment or Milestone: The juvenile pelagic shark survey, 1994 to present, provides a fishery-independent index of relative abundance, habitat distribution and size frequency trends for juvenile pelagic sharks in the Southern California Bight (SCB).

Background: Fishers ply the U.S. coastal and offshore waters between the borders of Mexico and Canada seeking swordfish (*Xiphias gladius*), tuna (*Thunnus* spp.), thresher (*Alopias* spp.), shortfin mako shark (*Isurus oxyrinchus*) and a variety of marketable but incidental species. An important bycatch of those fisheries is the blue shark (*Prionace glauca*) which is, for the most part, discarded at sea. An examination of the historical fishing and length frequency data from the CA/OR driftnet fishery indicated that west coast thresher shark stocks over fished in the early 1980s were rebounding in response to fishing regulations introduced in the mid-1980s. Determining trends in relative abundance for shortfin mako and blue sharks were more problematic because of evolving regulations affecting the fishery and the non-target status of those sharks.

In an effort to address concerns for a sustainable fishery on local stocks of pelagic sharks the FRD initiated an abundance survey for juvenile sharks during 1994. The California based longline fishery (1988 and 1991) targeted mostly juvenile shortfin mako and blue shark. This short-lived shark fishery provided baseline data from which an index of relative abundance could be constructed. These shark species are managed under the west coast FMP for highly migratory species. SWFSC staff will be conducting stock assessments for shortfin mako and thresher shark populations in FY05 and updating SAFE reports annually thereafter. In support of assessments, indices of relative abundance and changes in size and catch can provide fishery managers with important information on stock condition.

Purpose of Activity: Provide fishery-independent data on relative abundance, size of catch, and life history parameters needed to address issues of stock condition of FMP managed pelagic sharks.

Description of Accomplishment and Significant Results: The 2004 shark survey was completed July 7. A total of 6,692 hooks were fished at the 38 sampling stations. Captured sharks were tagged with conventional spaghetti tags, satellite transmitting tags and tetracycline. Catch included 88 mako, 127 blue, 2 common thresher shark and 59 pelagic rays. The preliminary data indicates overall catch rate was 0.399 per 100 hook-

hours for mako and 0.499 per 100 hook-hours for blue sharks. The cpue for mako was slightly higher than 2003 but continues a declining trend. The cpue for blue sharks was slightly lower than in 2003 and also continues a declining trend.

In addition, 62 sharks were tagged with conventional tags for movement data, 61 marked with OTC for age and growth studies, and 74 DNA samples were collected. Three adult blue sharks were tagged with a total of 6 satellite archival tags in a cooperative TOPP project to define the physical habitat of Pacific blue sharks. Four satellite pop up tags and 9 satellite transmitter tags were deployed on 10 individual mako sharks in a continuing series of habitat, migration and condition studies. Two common thresher sharks were also tagged with satellite pop up and transmitter tags. Early results indicate blue and mako sharks surface briefly and data transmissions are providing temperature, depth and location data. Five pelagic rays were collected by UCLA graduate students for growth and ageing studies. Monterey Bay Aquarium staff tested a new transport system designed to move live mako sharks to the Monterey Bay Aquarium for display purposes. A contract photographer from National Geographic documented the survey operations during Leg 1 of the survey.

Research conducted concurrently over the entire survey period included:

Conventional tags were deployed on most sharks as time and conditions permitted. Total tags deployed exceeds 2400 sharks. To date the recapture rate for shortfin mako is 4.3% and 11.8% for the common thresher.

Electronic tags were deployed on several sharks to study their movements and habitat preferences. In 1998 and 1999, common thresher sharks were tagged with acoustic tags and tracked for several days in the vicinity of Santa Monica Bay off Malibu. From 2002 to 2004, 12 blue sharks, 31mako sharks and 6 thresher sharks were tagged with pop-off satellite archival tags and real-time satellite transmitting tags. The figures below shows tracks of mako and blue sharks as reported by the real-time transmitting tags (Fig. 1, Fig 2.).

Beginning in 1998 selected shortfin mako and common thresher sharks were injected with quantities of OTC for age and growth studies. A total of 450 shortfin mako and common thresher were marked with size-specific quantities of OTC. Total recapture rate to date is 3.8%. Analysis is continuing by Center staff in the Shark Lab as samples are returned.

Survival of pelagic fish after release from fishing gear is important in terms of tag recapture analysis and for use in stock assessments. Blood was drawn from 74 mako, 68 blue sharks and 57 thresher shark for studies on condition at capture and post release survival studies. Preliminary assay of blood chemistry indicates very high catecholamine and lactate levels in all three species when compared to resting, captive sharks.

Beginning in 2001, DNA samples were collected from selected individuals for

population and differentiation studies. These samples are currently queued for analysis in the Division's DNA Lab. Heart, liver, gonad and muscle tissue are collected for a variety of ongoing studies including reproductive condition, heavy metal and DDT concentrations, and biochemical analysis. Stomachs are collected from moribund sharks for feeding pattern studies and to supplement ongoing food habitat studies at the Shark Lab. Physiological studies of swimming energetics were conducted in a self-contained, variable speed, water tunnel on 4 shortfin mako sharks and 6 pelagic rays.

Significance of Accomplishment: This survey provides data on relative abundance, size of catch, and life history parameters needed to address issues of stock condition. This is the only fishery-independent survey for pelagic sharks off the western United States. The FMP for highly migratory species establishes the requirement for Stock Assessment and Fishery Evaluations for these pelagic sharks. The survey indicates a negative CPUE trend of relative abundance for shortfin mako abundance. The CPUE trend for blue shark did not indicate a negative slope although that result was influenced by unusually large catch in 2000. The mean length of catch for shortfin mako and blue shark is apparently increasing. It is not know if this is because there are fewer young animals entering the local population or the proportion of larger animals has increased from offshore immigration of mature individuals. These trends do not necessarily indicate a decline in relative abundance; however, the data do indicate the need for continued monitoring.

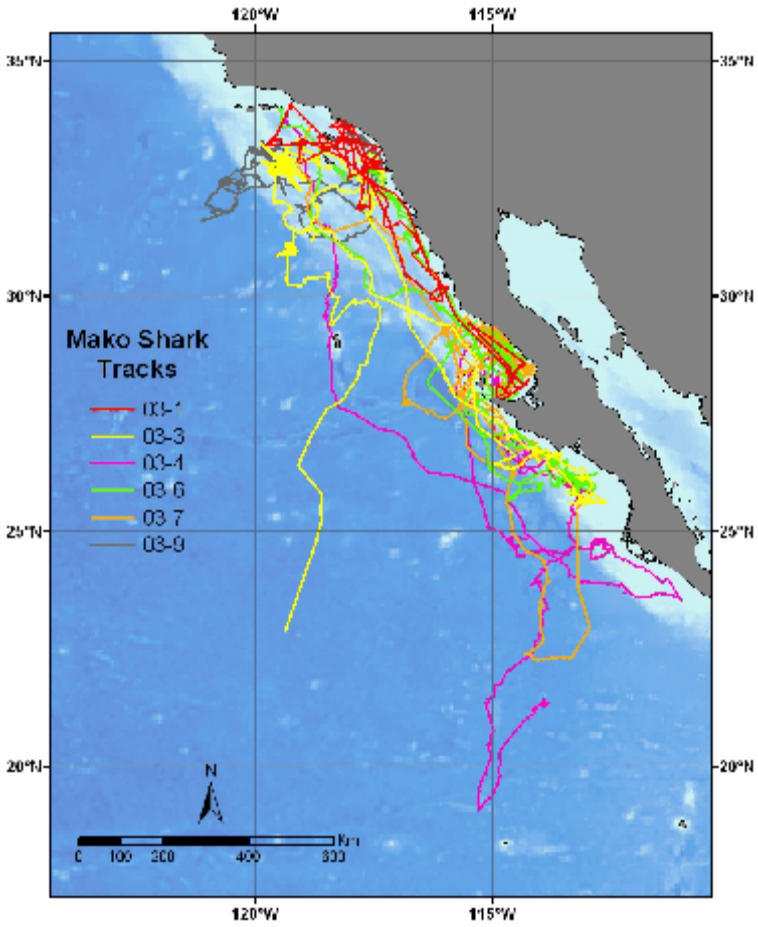

Figure 1. Six mako shark tracks as reported by the real-time satellite transmitting tags.

Problems: None

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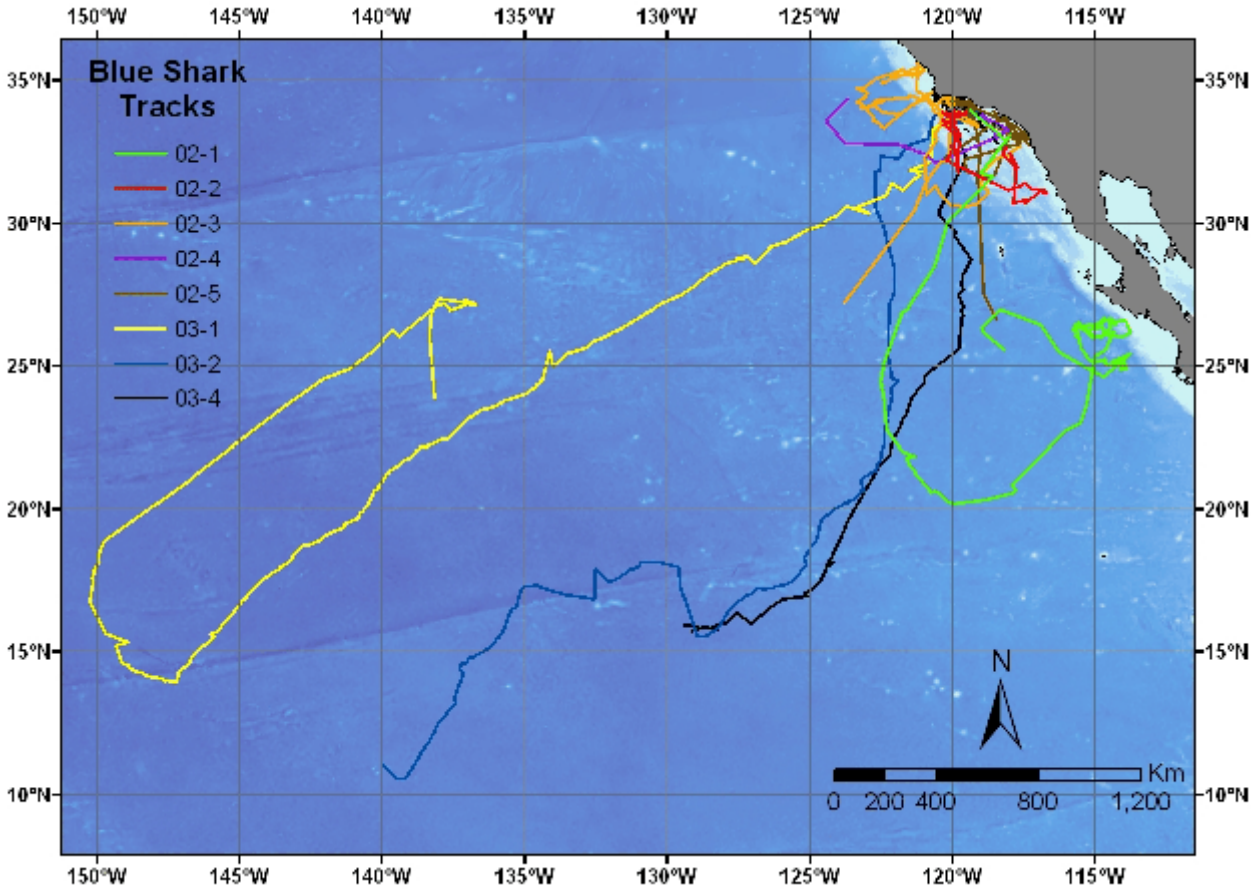

Figure 2. Eight blue shark tracks as reported by the real-time satellite transmitting tags.